A Metabolomic Approach to Diagnosing Prosthetic Joint Infection

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Background:
- Total joint replacements provide some of the greatest improvement in quality of life per dollar spent of any treatment [1].
- Knee and hip replacements together represent well over 90% of all joint replacements in the United States [2].
- Americans are living longer lives [3], so the number of hip and knee replacements will continue to rise.
- Knee and hip replacements significantly increase the susceptibility of these joints to infection, known as prosthetic joint infection (PJI).

Hypothesis: Volatilomic (volatile metabolomic) analysis can deliver a rapid, pathogen-specific enough:
1. **VOC analysis of explanted prosthesis sonicate fluid can identify prosthetic joint infection without a pre-culture step.**
2. **VOC analysis can discriminate between sterile and cultured synthetic synovial fluid.**

**Materials and Methods**

**Patient Samples (28)**
- In-Vitro Samples (28) & Explanted joint sonicate fluid, 13 PJI, 15 non-PJI
- **2-6 days**
- **83.3%**

**Conclusions and Future Studies**

**VOC-based PJI diagnostics are:**
- **72.7%** accurate in identifying patient centre
- **76.7%** accurate in distinguishing MSSA from MRSA
- **83.3%** accurate in distinguishing MSSA from MRSA

**Future Directions:**
- Could examine the performance of a patient synovial fluid based diagnostic for PJI
- Could expand the sample size to draw conclusions about pathogen identity from patient ex-vivo samples
- Could investigate the value of an intermediate culture step
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**References and Acknowledgements**

**Materials and Methods**

**Sample Sources**
- **Patient Samples (28)**
- **In-Vitro Samples (28)**

**GCxGC-TOFMS Analysis**

**Statistical Analysis**

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**Future Directions:**
- Could examine the performance of a patient synovial fluid based diagnostic for PJI
- Could expand the sample size to draw conclusions about pathogen identity from patient ex-vivo samples
- Could investigate the value of an intermediate culture step between obtaining a patient sample and analyzing its volatiles
- Could make a marketable diagnostic device based on these identified discriminatory VOCs

**Bibliography:**

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